International Journal of Applied Economics, Finance and Accounting
ISSN 2577-767X
Vol. 21, No. 1, pp. 102-111
2025
DOI: 10.33094/ijaefa.v21i1.2092

Effect of interbank deposit funding on the financial performance of deposit money banks in Nigeria

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Keywords:
Gross domestic product
Interbank
Return on equity.

JEL Classification:
E44; G21; G32; L25.

Received: *10 July 2024*
Revised: *18 November 2024*
Accepted: *9 December 2024*
Published: *6 January 2025*
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Abstract

Failures of banking institutions have been an ongoing concern in the international banking system often leading to large economic downturns. It is concerning how quickly banks might experience liquidity crises especially when monetary policy is loose and credit is liberal. The speed at which companies experience downturns is worrying although bank failures are not a novel occurrence. Therefore, this study examined how interbank deposit funding influences the financial performance of Deposit Money Banks (DMBs) in Nigeria using dynamic panel analysis of fully modified ordinary least square from 2011-2021. Ten deposit money banks were used. The results indicate that IBR does not have a significant impact on ROE suggesting that the source of funding through interbank deposits does not significantly influence the profitability of DMBs in Nigeria. However, other factors such as Capital Adequacy Ratio (CAR), Gross Domestic Product (GDP), and Firms Age (FAG) have significant effects on ROE. The study highlights the importance of considering multiple factors beyond just funding sources when assessing the financial performance of banks in Nigeria. The study recommended that DMBs should diversify their funding sources. This can include increasing efforts to attract customer deposits, exploring alternative funding mechanisms and reducing reliance on interbank deposits. Diversification can help mitigate funding risks and enhance profitability.

Funding: This study received no specific financial support.
Institutional Review Board Statement: The Ethical Committee of the Babcock University, Nigeria has granted approval for this study (Ref. No. 979/24).
Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.
Data Availability Statement: The corresponding author may provide study data upon reasonable request.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: Conceptualized, developed and supervised the writing of this manuscript, A.F.I.; assisted with data gathering, referencing and proof reading, A.C.O.; assisted with ensuring that the manuscript is in compliance with the journal's guidelines, O.P.I. participated in data analysis and discussion of findings, A.F.I., A.C.O. and O.P.I. All authors have read and agreed to the published version of the manuscript.

1. Introduction

In the international banking system, failures of banking institutions have been an ongoing concern that often causes large economic downturns. It is concerning how quickly banks might experience liquidity crises, especially when monetary policy is loose and credit is liberal (Pyle, 1997). The 2007–2009 global financial crisis exemplified how interbank lending disruptions could escalate systemic risks. The risk premium on interbank borrowing surged from 0% to 5% revealing the fragility of liquidity management following the collapse of Lehman Brothers in 2008 (McKibbin & Stoeckel, 2010).

The speed at which companies experience downturns is worrying although bank failures are not a novel occurrence (Pyle, 1997). Recent global financial and economic crises have shown how a loose monetary policy coupled with a liberal credit regime may lead to a liquidity crisis and, ultimately, a downturn in the economy. Many of the wealthiest people in the world lost a sizable portion of their wealth during the financial crises of

2007–2009 (Jhingan, 2012). Banks ceased lending to each other when Lehman Brothers collapsed in September 2008 increasing the risk premium for interbank borrowing from 0% to 5%. The harm was already done notwithstanding all of the efforts made by the government to provide liquidity into the financial markets (McKibbin & Stoeckel, 2010). Liquidity management is critical to the financial system's sustainability since banks often maintain a highly leveraged position to offset both anticipated and unforeseen changes in the balance sheet structure.

The ratio of loans to deposits represents the percentage of credit facilities to total deposits and is used as a device for assessing bank liquidity. The ratio will rise and the bank will benefit from more deposits that can be used to create risky assets. The Cash Reserve Ratio (CRR) policy which prevents credit-demanding clients from accessing 22.5% of the total customer deposits for advance is a significant obstacle in this scenario. It's a mechanism to control credit expansion. CRR has stayed at that level ever since CBN raised it from 20% to 22.5% in March 2016 (Central Bank of Nigeria, 2016). A tool of monetary policy used by the CBN to control the amount of liquidity in the banking industry. The cash reserve ratio (CRR) exposes banks to a particular kind of regulatory risk. The 2011 International Financial Policy Report indicates that it is also used to achieve prudential objectives, liquidity management and monetary control. The prudential objective is to provide a form of insurance against challenges with liquidity and solvency. Due to liquidity constraints imposed by regulatory restrictions such as the Cash Reserve Ratio (CRR) which restrict the amount of money available for lending, interbank deposits have emerged as a crucial source of funding for deposit money banks (DMBs) in Nigeria. Interest rate mismatches frequently result from banks' reliance on costly tenured and interbank deposits to cover liquidity expectations which compresses margins and has an impact on financial performance.

Furthermore, the importance of strong risk management procedures is highlighted by past bank failures in Nigeria, including those that resulted in the consolidation exercise in 2005 (Dugguh & Diggi, 2015). This study explores the intricate relationship between funding methods, liquidity management and bank stability to determine how interbank deposit funding affects the financial performance of Nigerian DMBs. The recent wide swings in interest rates significantly impair the financial institution's ability to fund its credit portfolio.

This is because urgent funding must be obtained through more expensive interbank deposits and higher rates must be offered to draw in public deposits. The varied interest rates that various banks give for a comparable amount of deposits are a reflection of their relative liquidity and urgency. Such emergency funding reduces the interest margin on loans, forcing DMBs to increase the price of their risk assets to offset the loss. This is detrimental to the nation's social-economic development and progress. Users of funds will similarly pass on the high cost to consumers of their goods and services since they too need to turn a profit to satisfy their investors' goals. Additionally, a large number of DMBs primarily rely on term deposits which have high interest rates. Moreover, a significant portion of the deposit portfolio of several other banks consists of extremely volatile public sector funds. In the past, the unexpected withdrawal of government money caused several banks to collapse and be liquidated. The CBN established an additional cash reserve policy on government-owned deposits in July 2013 at an interest rate of 50% which was increased to 75% on January 1, 2014 to prevent a structural deficit in the DMBs' deposit obligations (Central Bank of Nigeria, 2016).

The decline in liquidity in the Nigerian money market has further exacerbated the issue leading to credit rationing among banks and an increase in default risk. According to Ndukwe (2013) the CBN intervened by injecting funds into the banking system to improve liquidity. A notable intervention occurred in 2009 when the CBN and NDIC conducted a joint examination of 24 Deposit Money Banks (DMBs) leading to the removal of chief executive officers and executive directors of eight banks. N620 billion in liquidity support was given to these institutions which included "Equitorial Trust Bank, Afribank, Union Bank, Intercontinental Bank, Oceanic Bank, Finbank, Bank PHB, and Spring Bank Plc" (Central Bank of Nigeria, 2008). The purpose of this study is to investigate each bank's capital sufficiency and how it affects profit performance to shed light on the systemic challenges and underlying dangers facing the banking sector.

The first issue that keeps coming up and begs for answers is that banks are still subject to a lot of risks, both financial and non-financial which has a negative impact on their financial performance. Second, DMBs must still decide on the best course of action while taking policy summersaults, regulatory and supervisory setbacks and complexity into account even with attempts to establish a risk management framework. Thirdly, banks continue to have funding shortages that force them to turn to expensive wholesale funds (interbank and tenured deposits) which results in maturity and interest rate mismatches on their balance sheets because inexpensive retail deposits have grown insufficient. This research was done in line with the gaps identified above.

Significant gaps remain particularly concerning the role of interbank deposit funding despite extensive research on bank liquidity and performance. Existing studies such as Agbada and Osuji (2013) and Ajibike and Aremu (2015) focus broadly on liquidity management but often overlook the specific impact of interbank deposits on bank financial performance. Additionally, there is ample research on liquidity in other regions such as Morocco (Ferrouhi, 2014) and Iran (Hosseininassab, Yavari, Mehregan, & Khoshsima, 2013). Few studies compare liquidity challenges across African countries leaving a gap in cross-country analysis. Moreover, most research adopts a short-term approach with limited longitudinal studies examining the long-term effects of interbank deposit funding on Nigerian banks especially post-consolidation (Ikpefan, 2013). Another gap lies in the insufficient exploration of risk management dynamics particularly how liquidity risks associated with interbank funding affect the financial stability of banks (Owojori, Akintoye, & Adidu, 2011). Finally, empirical studies on the regulatory impacts of policies like the Cash Reserve Ratio (CRR) on interbank deposits and

bank profitability are scarce indicating a need for further exploration of the relationship between regulation, liquidity, and financial performance in Nigeria.

Therefore, this research is structured into the following five distinctive sections: the first section which is the introduction has been briefly reviewed above encompassing the background to the study and the problems statement. The second section reviews the literature of past studies, theories, and empirical studies; section three is devoted to the methodology while section four presents the result and discussion and section five presents the summary and recommendations for policy discussion.

2. Literature Review

Inter-bank Ratio (IBR) which is the total amount due from other banks divided by the total amount due to other banks. In view of the difficulty that could arise in analyzing zero values, we decided to use net absolute figures due to other banks. Moreover, we decided to use percentage changes of the net figures across the years within the study period to avoid another challenge in applying regression analysis to negative values.

Financial ratios such as return on equity (ROE) and return on assets (ROA) often show an entity's profitability (net profit) which is a solid indicator of financial success (Li & Zou, 2014). Nevertheless, since the businesses differ in size, it is inappropriate to utilize income figures expressed in absolute terms since we are unable to compare the financial performance of the two. As a result, the disparity in bank sizes will be lessened if ROA is used to gauge bank profitability (Duraj & Moci, 2015). The capacity of management to produce a higher level of profit with the same level of resources or the same level of profit with lesser resources may also be revealed by return on assets.

According to Hosseininassab et al. (2013) companies require transformational competence to attain the best level of efficiency in today's management activities. Return on equity (ROE) is more palatable when evaluated through the eyes of shareholders and potential investors.

A financial institution's profitability is impacted by external as well as internal factors. Guru, Staunton, and Balashanmugam (1999) claim that internal factors are controllable and represent the managerial practices and decisions made by banks with regard to capital, liquidity and expenditure management as well as the sources and uses of money. Environmental or particular to the company are examples of external variables that function outside the system. Researchers preferred employing ratios to quantify profitability to counteract the inflationary impact (Guru et al., 1999).

2.1. Loanable Funds Theory

The idea which was first put out by Swedish economist Wicksell (1989) expands on the traditional theory that bases interest rates on savings and investment by including bank credit (Ohlin, 1937). When the amount of money requested by a borrower and the amount of money provided by the financial institution are equal, the market rate of interest also known as the equilibrium interest rate is reached. If the cost of purchasing the funds drops, the borrower or investor is motivated to demand more and he withdraws from borrowing more when the rate of interest starts to climb. The return (interest income) that the lender receives is equal to the interest cost that the borrower pays.

A rise in investor demand for capital at the current equilibrium rate will result in surplus demand that the market is unable to provide. Fund owners must receive a greater yield on their investment before giving up their money. A new, higher equilibrium interest rate is reached when the offer from those ready to borrow drives up the interest rate. This will lessen the surplus demand for loanable cash and deter certain borrowers from taking loans.

However, loanable funds theory has faced criticisms on a number of points. It has been based on the assumption of full employment which is not realistic in most economies of the world that are suffering from high rates of unemployment and underemployment. The theory is also based on the fact that savings and income are independent as they do not influence one another but in reality savings depend on income. The two variables are directly related. Savings generally can only an increase with increase in income and by extension, an increase in loanable funds. Another assumption of the theory says that savings is a function of interest rate and investment is also a function of interest rate. In reality, it is not only interest rate that determines investment. Investment has many faces which include replacing old equipment or existing processes in a system to make the system more effective or an outlay in an entirely new venture. Factors affecting go beyond only interest rate. The demand for and supply of loanable funds is generally determined by the cost of capital notwithstanding these critical factors. Government policies targeted at reducing the cost of borrowing will stimulate economic growth and development.

2.2. Hypothesis Development

Numerous academics in this field have carried out numerous research studies that demonstrate the extent to which risk management elements impact deposit money institutions' financial performance. The consistency of the correlations was ascertained by reviewing a selection of the empirical information. Comparing the variety of these findings from different viewpoints and circumstances was also helpful. Li and Zou's (2014) study examined how credit risk management affected European commercial banks' earnings throughout the 2007–2012 period using information from 47 of these institutions. For the analyses, statistical methods such as a panel regression were employed. Research results showed a favourable correlation between bank profitability

and credit risk management. In particular, there is an adverse relationship between the non-performing loan ratio (NPLR) and both ROE and ROA. This suggests that the bank's profitability will rise if credit risk management is effective enough to lower the net positive loan ratio. Additionally, this study discovered that there is erratic and unstable trending in the relationships among these factors.

Using several statistical techniques, Saeed and Zahid (2016) conducted a second research in the UK to examine how credit risk affected the profitability of five large UK commercial banking institutions. This inquiry for the study was conducted between 2007 and 2015. The dependent variables in this study were net interest margin, ROE, and ROA. Financial leverage and non-performing loans were used as stand-ins for credit risk while the firm's size and growth were moderating factors. The results of the study indicated an association between financial institutions' profit performance and credit risk indicators related to leverage ratios and non-performing loans. Berríos (2013) gathered data collected from the annual financial statements of forty public state commercial banks during a five-year period from 2005 to 2009 to conduct a study on the relationship among bank credit risk and performance and liquidity in the United States of America (USA). The debt-to-equity ratio, loans-to-deposit ratio and loan loss provisions are the independent variables for profitability while ROA and ROE are the dependent ones. The purpose of the study was to determine the effects of reckless severely vulnerable lending on bank liquidity and profitability using a multiple regression model. The results of the study demonstrated a positive relationship between ROA and less conservative behaviour such as a higher ratio of non-performing loans or larger loan loss provisions.

In Hakimi and Zaghdoudi's (2017) study, ten Tunisian banks' performance from 1990 to 2013 was examined in connection to liquidity risk using a panel-based random effect technique. The study's findings showed that bank performance and credit risk were negatively correlated. Lartey, Antwi, and Boadi (2013) studied seven of the nine banks that are listed on the country's stock exchange to determine the relationship between profitability and liquidity in Ghana. This study used secondary data from institutions' annual reports from 2005 to 2010 to calculate profitability and liquidity ratios and regress the liquidity ratio on the profitability ratios. The study's findings indicate that both the profitability and liquidity ratios worsened over the course of the inquiry.

Ravi (2014) conducted a follow-up study on the effects of loan diversification on risk and returns at Central Cooperative Banks in Punjab, India using standard regression techniques and the weighted average Hirschman-Herfindhal Index after the adoption of the New Economic Policy in 1991.

The study found that loan diversification did not considerably lower risk and instead had a negative impact on yield on assets. Singh (2014) conducted a study similar to this one in India to ascertain how loan diversification affected risk and return in cooperative banks following the New Economic Policy (NEP)'s implementation in 1991. The study's findings demonstrated that although diversification hasn't assisted in lowering risk in India, it does have a negative impact on asset yield.

Ferrouhi (2014) studied the relationship among liquidity risk and financial performance in four Moroccan banking institutions from 2001 to 2012 to identify the factors that affected the banks' performance. A portion of the results indicated that one of the major factors influencing a bank's success is its size while the findings indicated a positive relationship between the two.

Additionally, Olarewaju and Adeyemi (2015) used 15 listed banks out of the total of 19 banks that were chosen for the study to conduct research to investigate the presence and direction of causation among liquidity and profitability of bank deposits in Nigeria. The Granger causality test pairwise was used to find out whether there was a causal relationship between bank profitability and liquidity. The results of the research demonstrated that there exists no causal relationship among the loans-to-deposit ratio, a proxy for liquidity and ROE, a measure of profitability for banks at the 5% and 10% levels of significance. The outcome indicates a hint of a one-directional causation link between liquidity and profits for a different set of banks.

Similarly, Ajibike and Aremu (2015) investigated how Nigerian commercial banks performed in relation to liquidity. Using a Generalised Method of Moments (GMM) estimate approach, the researchers discovered a significant correlation spanning bank performance and liquidity for a sample of thirteen financial institutions from 2004 and 2012. In particular, they discovered that the size of the board, bank liquidity, and debt structure are important factors that influence how well banks function in Nigeria. They suggested that for banks to perform better, they should manage their debt more skillfully and boost their liquidity base. They also suggested that the CBN implement measures to guarantee banks have a sufficient and high degree of liquidity. Bassey, Tobi, Bassey, and Ekwere (2016) evaluated the fiscal health of Nigerian banks with regards to liquidity management between 2000 and 2010. The study examines the relationship between the variables of bank performance and liquidity management using bank deposit; cash reserve requirement, bank investment and cash ratio as indicators. The data, primarily from CBN's statistics bulletin have been examined using simple regression modelling and basic percentages. The findings indicate that bank investment and cash ratio as well as bank deposit and reserve requirement are significantly correlated. Therefore, these results which corroborate those of other research of a similar kind underscore once again how crucial efficient and effective liquidity management is to the long-term viability of banks. As a result, they advised banks to take alternative steps to lessen illiquidity in this industry rather than focusing just on deposits.

Agbada and Osuji (2013) also conducted research on the effectiveness of liquidity management and banking performance in Nigeria to investigate empirically the influence of efficient liquidity management on the financial health of Nigerian banks, especially after many reforms, the CBN bailout effort and the subsequent acquisitions and mergers. We used profitability and return on capital employed (ROCE) as our

dependent variables or performance indicators and we used a survey using random sampling to gather data for our study. Descriptive analysis was performed following the computation of the relationship test using structured questionnaires. The results of the empirical investigation demonstrate that effective liquidity management improves a bank's soundness and that there is a substantial relationship between banking performance and effective liquidity management.

Agbada and Osuji (2013) concluded that profitability and effective liquidity management are strongly positively correlated based on a determined correlation value of 0.861. Additionally, they calculated the relationship between effective liquidity management and return on capital employed arriving at 0.908. They proposed that there is a substantial positive relationship between the two variables. These results are consistent with other findings from related research that were previously highlighted. Therefore, they suggested a more professional approach to liquidity management taking into account the systemic effects of illiquidity in the financial system. Nevertheless, Ikpefan (2013) found that the level of capital adequacy has a negative effect on ROA when he examined the impact of Nigerian commercial banks' capital adequacy ratios between 1986 and 2006 with the use of panel regression models for banks.

The impact of financial goods on the performance of certain Nigerian deposit money banks was examined by Akwam and Yua (2021). They looked at how the performance of the financial institutions was affected by point-of-sale (POS), automated teller machine (ATM) and mobile banking services using regression analysis. The results showed that ATMs increased profits EPS, POS had a favourable impact on ROE and mobile banking considerably increased ROA and EPS. This investigation provides strong evidence that the introduction of financial services in a highly competitive market may greatly increase banks' efficacy as indicated by profit indicators. Olunuga and Agbesuyi (2023) looked into how cross-bank transactions and DMBs relate to Nigeria's financial performance and sustainability. Their study highlights the significance of liquidity management in maintaining liquid strength particularly in relation to interbank financing and lending. This study arrived at the conclusion that interbank transactions had a positive effect on the sustainability and financial health of financial institutions using appropriate statistical techniques to examine the data. The findings of the investigation emphasize that banks deposit cash and consider interbank loans and deposits to be wise investment options. Ashiru, Balogun, and Paseda (2023) focused on the impact of financial development (FI) on the performance of Nigerian commercial banks particularly during the 2008 global financial crisis. This study examined the effects of mobile, internet, ATM and other electronic forms of banking on bank performance using the Schumpeter Theory of Innovations Diffusion and constraint-induced innovation in bank theories. The authors of these studies looked at secondary source information from the NDIC, NIBSS, and Central Bank of Nigeria using the ARDL model. Their research indicates that the largest impact on the bank's success is caused by the large volume of transactions related to point-of-sale (POS) services. In addition to financial innovations, like credit and debit cards, online banking and mobile banking possess significant effects on both long- and short-term financial health. Nevertheless, it was discovered that the performance impact of NEFT and NIP services was insignificant. This research recommends expanding mobile and online banking options to enhance overall financial results. As a whole, these studies highlight how important financial innovations, products, and interbank transactions are to improving the long-term viability and financial performance of Nigeria's deposit money banks. The results imply that enhancing financial outcomes in the banking industry requires both the adoption of new technologies and the development of confidence in interbank markets. One key issue the study has noticed was the discrepancy of the result. While a voluminous study has been researched on interbank deposit funding and financial performance, the study's use of traditional panels has limited the study to properly forecasting for the long- and short-run effects. Therefore, this study applied the panel fully modified ordinary least square. The use of FMOLS is important than traditional panel fixed effects and pooled regression because FMOLS addresses issues of non-stationarity and cointegration in panel data which have made the earlier research on the study liable to sporous results. Traditional methods like fixed effects or pooled regression assume stationarity of variables and do not account for long-run relationships between them leading to biased estimates when dealing with non-stationary data. However, FMOLS corrects for both endogeneity and serial correlation in the presence of integrated relationships ensuring more reliable and efficient estimates particularly in long-term panel studies involving heterogeneous cross-sectional units.

In addition, numerous academics have been drawn to this field of research and while they have addressed it from various angles, they have typically focused more on market, liquidity, credit, capital, operational hazards, and financial performance in banking organisations. The researcher noticed that interbank funding has received very little attention despite the fact that asset-liability maturity mismatches have a major influence on interest rate spread and, ultimately, profitability. Since interest revenue accounts for the majority of a bank's reported earnings, risk assets are its most profitable assets. Banks must raise their interest margin to generate larger profits and lowering their cost of funding as much as possible is essential to doing this. The ideal balance of asset and liability portfolios must be maintained while adhering to regulatory requirements to reduce funding costs and boost revenue. The study's guiding hypotheses are as follows:

H_0: There is no significant effect of interbank deposit funding on the financial performance of deposit money banks in Nigeria.

H_1: There is no significant effect of interbank deposit funding on the financial performance of deposit money banks in Nigeria.

3. Methodology

3.1. Research Design

We outline the procedures to be followed in this section to investigate the research enquiries and formulate hypotheses. The processes include the study population, research design, data collecting and processing techniques, model formulation, a priori expectations consistent with established hypotheses and post-estimation testing.

Combined survey and ex post facto research methodologies were used in this study. Firstly, primary data were collected by the distribution of questionnaires to managerial bank employees particularly those in the credit, relationship, and risk management divisions. The effectiveness of risk management tactics used by Nigerian deposit money institutions was evaluated using the main data. Numerical secondary data were gathered and subjected to statistical and econometric analyses to look at the relationships between financial performance and risk management indications as well as the influence of interbank deposit funding and risk management indicators on the financial results of DMBs in Nigeria regarding the ex post facto research design.

3.2. Sample and Data

The population being studied consisted of 26 Deposit Money Banks (DMBs) located in Nigeria. The DMBs were classified into five categories based on the Central Bank of Nigeria's updated list as of May 25, 2016 which included merchant banks with national operating licenses (4), non-interest financial services with national operating licenses (1), commercial banks with regional operating authorizations (2) and commercial banks with global working licenses (10). The sample size selected for the study was 10 out of the 26 DMBs specifically focusing on commercial banks with both national and international operating licenses. These 10 banks representing about 75% of all DMBs were chosen based on their deposit share aiming to ensure that the outcomes of the research would be representative of the industry. Selection criteria included rankings by Nairametrics and Nigerian Finder focusing on deposit base with global competition and profitability. The selected DMBs were Zenith Bank, GTBank, First Bank, Access Bank, United Bank for Africa, Fidelity Bank, Ecobank, Wema Bank, First City Monument Bank, and Union Bank. The data cover a period of eleven years to capture the trends and variations that span 2011 and 2021.

3.3. Measurement of Variables

Return on Equity (ROE) which is derived from annual reports and is computed as profit after tax divided by total equity, gives information on how well a business generates profit from equity. The Non-Performing Loans ratio (NPL) which is also derived from yearly reports is calculated by dividing the total value of substandard, questionable and lost loans by the total loan portfolio. This indicates the risk and quality of the loans. The Capital Adequacy Ratio (CAR) which is determined by dividing the risk-weighted assets (Basel 2) by the total of the core capital plus additional capital is a measure of the financial institution's financial health. Annual statements are the source of this information. The Interbank Ratio (IBR) which is determined using annual statistics is the ratio of interbank placements to interbank deposits or interbank lending activities. The Size of the Firm (FSZ) which is determined by taking the log of the total asset values is included in annual reports and provides an operational scale. Finally, the Gross Domestic Product (GDP), a gauge of economic activity is computed using the nominal GDP data from the CBN statistical report.

3.4. Models

The following equation represents the model showing how interbank deposit funding affects the financial performance of deposit money banks in Nigeria:

$$ROE_{it} = b_0 - b_1 IBR_{it} + + b_2 CAR_{it} + b_3 GDP + b_4 FSZ_{it} + b_5 FAG_{it} + e_{it}$$

Where

Capital Adequacy Ratio (CAR), Interbank Ratio (IBR), GDP, Firm Size (FSZ), and Firm Age (FAG) are the independent variables while Return on Equity (ROE) is the dependent variable. The equation has b_0 an intercept or constant, b1–5 as parameters and e as the residual or individual bank *i* in year *t denoting it.*

3.5. Statistical Analysis

Panel fully modified ordinary least squares (PFMOLS) is the estimate method used in this study. A reliable econometric technique for panel data analysis, PFMOLS excels in handling endogeneity and autocorrelation problems. The PFMOLS approach adds instrumental variables (IV) and error correction terms to the conventional fully modified OLS to address potential biases in the estimation. Lagged values of the dependent variable and instrumental variables are used as instruments by the PFMOLS estimation to handle endogeneity. Furthermore, the error correction component enhances the efficiency and dependability of the estimation by enabling the dependent variable to be adjusted to approach its long-run equilibrium.

4. Result and Analysis

Table 1 reveals the descriptive statistics for Return on Equity (ROE), Interbank Ratio (IBR), Capital Adequacy Ratio (CAR), Gross Domestic Product (GDP), Firm Size (FSZ), and Firm Age (FAG). The average Return on Equity (ROE) is 0.106% with a median of 0.116. The Interbank Ratio (IBR) has a mean of 1.376 and

a mean of 0.33, and the Capital Adequacy Ratio (CAR) has a mean of 0.200 and a median of 0.193. GDP has a mean of approximately 1.11E+14 (1.11 trillion) and a median of approximately 1.03E+14 (1.03 trillion). The Firms Size (FSZ) has a mean of 9.346 and a median of 9.36. The Firms Age (FAG) has a mean of 39.20 and a median of 33.

The maximum ROE is 0.321, IBR is 31.614, CAR is 0.438, GDP is approximately 1.76E+14 (1.76 trillion), FSZ is 10.053, and FAG is 76. The minimum ROE is -0.731, IBR is 0.004, CAR is 0.097, GDP is approximately 6.31E+13 (631 billion), FSZ is 8.336, and FAG is 21.

The standard deviations for these variables are 0.137 (ROE), 3.825 (IBR), 0.051 (CAR), 3.47E+13 (GDP), 0.394 (FSZ), and 14.885 (FAG). The skewness values indicate the degree of asymmetry in the distribution of each variable with ROE being negatively skewed, IBR being highly positively skewed, CAR being moderately positively skewed, GDP being slightly positively skewed, FSZ being slightly negatively skewed and FAG being positively skewed.

Kurtosis measures the peakedness of the distribution. ROE has a high kurtosis value indicating a very peaked distribution. IBR, CAR, GDP and FAG also have high kurtosis values indicating peaked distributions while FSZ has a moderate kurtosis value. The Jarque-Bera test is a test for normality. For all variables except GDP and FSZ, the test indicates non-normality as the p-values are below the typical significance level of 0.05. This suggests that these variables do not follow a normal distribution.

Table 1. Descriptive statistics.

Descriptive	ROE	IBR	CAR	GDP	FSZ	FAG
Mean	0.106	1.376	0.200	1.11E+14	9.345	39.200
Median	0.116	0.330	0.193	1.03E+14	9.360	33.000
Maximum	0.320	31.614	0.438	1.76E+14	10.054	76.000
Minimum	-0.730	0.004	0.097	6.31E+13	8.336	21.000
Std. dev.	0.136	3.824	0.050	3.47E+13	0.394	14.886
Skewness	-3.049	5.951	1.062	0.407	-0.359	0.881
Kurtosis	17.848	42.227	6.326	2.009	2.550	2.741
Jarque-Bera	1180.826	7701.833	71.395	7.542	3.299	14.529
Probability	0.000	0.000	0.000	0.023	0.192	0.001
Sum	11.678	151.338	22.053	1.22E+16	1028.008	4312.000
Sum sq. dev.	2.042	1594.641	0.279	1.31E+29	16.922	24151.60
Observations	110	110	110	110	110	110

Note: Return on equity (ROE), Interbank ratio (IBR), Capital adequacy ratio (CAR), Gross domestic product (GDP), Firms size (FSZ), Firms age (FAG). Where E+ stands for "exponent" (base 10).

The correlation matrix in Table 2 shows the pairwise correlations between the variables. Return on Equity (ROE), Interbank Ratio (IBR), Capital Adequacy Ratio (CAR), Gross Domestic Product (GDP), Firm Size (FSZ), and Firm Age (FAG). ROE has a weak negative relationship with IBR (-0.032) and a moderate direct relationship with GDP (0.252), FSZ (0.452), and a moderate negative relationship with FAG (-0.301). IBR has weak negative relationships with ROE (-0.032) and CAR (-0.065). CAR has a weak negative relationship with ROE (-0.120) and a weak direct relationship with FSZ (0.036). GDP has a weak direct relationship with ROE (0.252) and a weak negative relationship with CAR (-0.284) and FAG (0.211). FSZ has moderate direct relationship with ROE (0.452) and a weak direct relationship with GDP (0.442). FAG has a moderate negative relationship with ROE (-0.301) and weak negative correlations with CAR (-0.233) and GDP (-0.368). To test for multicollinearity among the independent variables, we typically look for high correlations (greater than 0.7 or less than -0.7) between independent variables. In this correlation matrix, none of the correlations exceed 0.7 in magnitude indicating that multicollinearity may not be a significant issue among the independent variables.

Table 2. Correlation matrix.

VAR	ROE	IBR	CAR	GDP	FSZ	FAG
ROE	1					
IBR	-0.032	1				
CAR	-0.120	-0.064	1			
GDP	0.252	-0.113	-0.284	1		
FSZ	0.452	-0.151	0.036	0.442	1	
FAG	-0.301	-0.049	-0.233	0.210	-0.367	1

Note: Return on equity (ROE), Interbank ratio (IBR) Capital adequacy ratio (CAR), Gross domestic product (GDP), Firms size (FSZ), Firms age (FAG).

Table 3 presents the results of the unit root test using the Phillips-Perron (PP) test statistic, specifically the Fisher Chi-square statistic and its associated probability. From table 2, it deduced all variables (ROE, IBR, CAR, GDP, FSZ, and FAG). Fisher chi-square statistics that are highly significant with p-values of 0.0000 indicating that the null hypothesis of a unit root is rejected for all variables. This suggests that all the

variables are stationary after differencing that is integrated of order one (1). Hence, this called for a cointegration test.

Table 3. Unit root test: Philip Perron-Fisher chi-square.

Variables	PP	Probability	Integration
ROE	148.740	0.000	1(1)
IBR	65.595	0.000	1(1)
CAR	61.527	0.000	1(1)
GDP	56.8768	0.000	1(1)
FSZ	49.834	0.000	1(1)
FAG	165.786	0.000	1(1)

Note: Return on equity (ROE), Interbank ratio (IBR) Capital adequacy ratio (CAR), Gross domestic product (GDP), Firm size (FSZ), Firm age (FAG).

Table 4 presents the results of the Padroni residual cointegration test which was conducted to assess the presence of cointegration among the variables Return on Equity (ROE), Interbank Ratio (IBR), Capital Adequacy Ratio (CAR), Log Gross Domestic Product (LGDP), Firms Size (FSZ), and Firms Age (FAG). The test utilized both the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) statistics to examine cointegration. The results indicate clear evidence regarding cointegration among the variables. For the individual variables, the ADF statistics though suggest no cointegration as their p-values are not significant. However, the PP statistics for these variables show some evidence against the null hypothesis of no cointegration. On the other hand, the group statistics provide more consistent evidence of cointegration. The group rho and PP statistics indicate strong evidence against the null hypothesis of no cointegration, suggesting that there is cointegration among the variables when considered together as a group. The group ADF statistic also provides evidence against the null hypothesis as its p-value stands at 0.029 below the typical significance level of 0.05. Overall, the result showed the presence of cointegration and ensured the reliability of the findings.

Table 4. Pedroni residual cointegration test.

Series: ROE IBR CAR LGDP FSZ FAG				
Weighted				
Panel	**Stats**	**Prob.**	**Stats**	**Prob.**
V-statistic	-1.656	0.951	-3.088	0.999
Rho-statistic	2.542	0.995	2.820	0.998
PP-statistic	-3.312	0.001	-9.075	0.000
ADF-statistic	0.151	0.560	-3.511	0.000
Group statistic	Stats	Prob.		
Rho	4.093	1.000		
PP	-9.913	0.000		
ADF-	-1.896	0.029		

Note: Return on equity (ROE), Interbank ratio (IBR) Capital adequacy ratio (CAR), Gross domestic product (GDP), Firm size (FSZ), Firm age (FAG).

Table 5 presents the panel regression analysis using the Fully Modified Least Squares (FMOLS) method to investigate the effect of interbank deposit funding on the performance of deposit money banks in Nigeria. These variables used were Interbank ratio (IBR), Capital Adequacy Ratio (CAR), Log Gross Domestic Product (LGDP), Firms Size (FSZ), and Firms Age (FAG) while banks performance was proxied with Return on Equity (ROE) of Deposit Money Banks (DMBs) in Nigeria.

It was calculated that the IBR parameter is approximately 0.002992. The corresponding coefficient was shown to be insignificant beneath the 5% level with a probability value of 0.1938. This implies that IBR and ROE do not significantly relate to one another. On the other hand, the CAR parameter was established to be -0.925900. This coefficient was determined to be highly significant within the 1% threshold with a p-value of 0.0006. This suggests that there is a substantial inverse relationship between CAR and ROE meaning that DMBs in Nigeria with greater CAR have lower returns on equity.

The estimated value of the LGDP parameter was 1.188963. This parameter was determined to be highly significant at the 1% level having a probability value of 0.0033. This implies that LGDP and ROE have a strong and positive relationship meaning that higher GDP is linked to better returns on equity.

The coefficient for FSZ was calculated to be 0.064320 with a p-value of 0.5001. However, it was not significant within the 5% level. This suggests that the size of the company and ROE have no meaningful relationship.

Finally, it was estimated that the coefficient for FAG was -0.118181. This coefficient was determined to be statistically significant at the 1% level with a p-value of 0.0033. This suggests that older enterprises are linked to poorer ROE for DMBs in Nigeria as there is a substantial negative relationship between FAG and ROE. The modified R-squared value of 0.403119 shows that 40.31% of the variation in ROE is explained by the model with respect to the overall fit of the model.

Table 5. Model on interbank deposit funding and financial performance of DMBs in Nigeria.

Dependent variable: ROE				
Method: FMOLS				
Variables	**Coeff.**	**S. E**	**t-stat**	**Prob.**
IBR	0.003	0.002	1.309	0.193
CAR	-0.926	0.261	-3.552	0.000
LGDP	1.1889	0.393	3.026	0.003
FSZ	0.064	0.094	0.677	0.500
FAG	-0.118	0.039	-3.028	0.003
R^2	0.487	MDV		0.124
Adj- R^2	0.403	S.D. dependent var		0.095
S.E. of regression	0.073	SSR		0.459
Long-run variance	0.005			

Note: Return on equity (ROE), Interbank ratio (IBR) Capital adequacy ratio (CAR), Gross domestic product (GDP), Firm size (FSZ), Firm age (FAG).

The empirical results of this study point to several significant consequences. This study concluded that there was no substantial influence of Interbank Ratio (IBR) or Firm Size (FSZ) on ROE consistent with several earlier research findings. This is consistent with research conducted in the USA by Berríos (2013) who discovered a positive relationship between ROA and increased prudence (i.e., a greater ratio of non-performing loans or loan loss reserves) which is conceptually related to CAR. Furthermore, Ajibike and Aremu (2015) discovered a positive relationship between bank performance and liquidity in Nigeria which is in line with the noteworthy negative correlation between FAG and ROE in the Nigerian investigation.

In contrast to the non-significant effect of IBR in the Nigerian setting, the study by Li and Zou (2014) discovered a favourable relationship between credit risk management and profitability in European commercial banks. Similarly, Saeed and Zahid (2016) found positive relationships between credit risk indicators and bank profitability in the UK which is different from the non-significant impact of FSZ in the Nigerian study.

5. Conclusion and Findings

The study looked at how interbank deposit funding influenced the financial performance of Deposit Money Banks (DMBs) in Nigeria from 2011 to 2021. The study examined ten deposit money institutions in Nigeria. Dynamic panel regression was used with an emphasis on fully modified ordinary least squares and inferences were made at the 5% significance level. The research found that IBR had no substantial influence on DMBs' return on equity (ROE). This shows that interbank deposits do not have a substantial impact on the profitability of DMBs in Nigeria. Other characteristics such as capital adequacy ratio (CAR), GDP, and firm age (FAG) were found to have a greater impact on ROE.

The study emphasises the need of taking into account more than just funding sources when evaluating Nigerian banks' financial performance. The study's findings have various implications for policy and practice in Nigeria's banking system. The considerable impact of Capital Adequacy Ratio (CAR), Gross Domestic Product (GDP) and Firm Age (FAG) on Return on Equity (ROE) demonstrates the vital role of adequate capital management, economic growth, and the vitality of younger firms in driving bank profitability.

It is critical to provide an environment that allows banks to uphold sufficient capital levels, encourage economic growth and assist the development of emerging enterprises. In a nutshell, while IBR may not have a direct impact on DMBs' financial performance, other factors emphasize the need for a comprehensive approach to bank management and oversight in Nigeria.

5.1. Recommendations

The following recommendations were made:

1. Diversifying funding sources is advised for Nigerian Deposit Money Banks (DMBs) as the interbank ratio has no major impact on their financial success. This may involve boosting attempts to solicit consumer deposits, investigating other funding channels, and decreasing reliance on interbank deposits. Diversification can reduce funding risks and increase profitability.
2. DMBs should prioritize maintaining healthy capital levels as the Capital Adequacy Ratio (CAR) significantly impacts Return on Equity (ROE). This includes meeting regulatory capital obligations, actively managing money to support business growth and evaluating capital optimization initiatives. Strong capital management not only improves financial performance, but also increases banks' resilience to economic downturns.
3. The study discovered that ROE is significantly impacted by enterprises age (FAG) highlighting the need of fostering the growth of younger enterprises. The implementation of policies and initiatives that support the expansion and viability of younger businesses such as granting access to funding, business development assistance, and mentorship programs should be taken into consideration by policymakers and financial institutions. Encouraging younger businesses can boost the economy and give DMBs the chance to develop their clientele and increase their profitability.

5.2. Limitation

This study's predicting capability and predictability strength are confined to Nigerian deposit money banks, implying that other financial institutions and cross-border deposit money banks may not be able to rely on the results. Furthermore, the adoption of a short eleven-year timeframe and ten banks restricted the scope of interpretations throughout time.

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